


JC15 Rec'd PCT/PTO 29 NOV 2001

FORM PTO-1390 (REV 10-94)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		DOCKET #: 4925-184PUS
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				
				U.S. APPLICATION NO. If known, see 37 CFR 1.5) 09/980376
INTERNATIONAL APPLICATION NO. PCT/EP00/04231		INTERNATIONAL FILING DATE 09 May 2000		PRIORITY DATE CLAIMED 04 June 1999
TITLE OF INVENTION Releasing a Connection in a Wireless Communication Network				
APPLICANT(S) FOR DO/EO/US Serge HAUMONT; Kalle AHMAVAARA				
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</p> <p>6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input checked="" type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). Unexecuted</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p>Items 11. to 16. Below concern other document(s) or information included:</p> <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p><input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information (<i>specify</i>): PCT Publication Sheet, Int'l Preliminary Examination Report, Int'l Search Report, PCT Request, PCT Demand, Notice Informing the Applicant of the Communication of the International Application to the Designated Offices</p>				

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U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 09/980376		INTERNATIONAL APPLICATION NO. PCT/EP00/04231		ATTORNEY'S DOCKET NUMBER 4925-184PUS	
17.[x]The following fees are submitted:					
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO\$890.00 International preliminary examination fee paid to USPTO (37 CFR 1.482).....\$710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO\$1040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$	890
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	96 - 20 =	76	x \$18.00	\$	1368
Independent Claims	1 - 3 =	0	x \$84.00	\$	
Multiple dependent claim(s) (if applicable)			+ \$280.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$	2258
Reduction of 1/2 for filing by small entity, if applicable.				\$	
SUBTOTAL =				\$	2258
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$	2258
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by the appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$	
TOTAL FEES ENCLOSED				\$	2258
Amount to be refunded:				\$	
charged:				\$	
a. [x]One check in the amount of \$ 2258 to cover the above fee is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 03-2412 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. [x]The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 03-2412. A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Michael C. Stuart Cohen, Pontani, Lieberman & Pavane 551 Fifth Avenue, Suite 1210 New York, New York 10176			 Michael C. Stuart Registration Number: 35,698 November 29, 2001 Tel: (212) 687-2770		

09/980376

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By Express Mail # EV052763136US · November 29, 2001

Attorney Docket # 4925-184PUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re National Phase PCT Application of

Serge HAUMONT et al.

International Appln. No.: PCT/EP00/04231

International Filing Date: 09 May 2000

For: Releasing a Connection in a Wireless
Communication Network

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents

Washington, D.C. 20231

BOX PCT

S I R:

Prior to examination of the above-identified application please amend the
application as follows:

In the Specification:

On page 2, after line 32 (last line), insert the following as a new paragraph:

--Other objects and features of the present invention will become apparent from the following
detailed description considered in conjunction with the accompanying drawings. It is to be
understood, however, that the drawings are intended solely for purposes of illustration and not as

a definition of the limits of the invention, for which reference should be made to the appended claims.--

On page 15, after line 17 (last line), insert the following as a new paragraph:

--Thus, while there have been shown and described and pointed out fundamental novel features of the present invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices described and illustrated, and in their operation, and of the methods described may be made by those skilled in the art without departing from the spirit of the present invention. For example, it is expressly intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.--

On page 16, line 1, delete "CLAIMS:" and insert therefor --What is claimed is:--.

In the Claims:

Please amend 4, 9, 12, 13, 16-19, 21, and 22 to read as follows:

4. A network element as claimed in claim 2, wherein said network element is arranged to send a message to the end element indicating that said connection has been released.

9. A network element as claimed in claim 1, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

12. A network element as claimed in claim 1, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

13. A network element as claimed in claim 1, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

16. A network element as claimed in claim 1, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

18. A network element as claimed in claim 1, wherein said network element is a radio network controller.

19. A network comprising a network element as claimed in claim 1, an end station and an end element.

21. A network element as claimed in claim 19, wherein said end element is SGSN.

22. A network as claimed in claim 19, wherein said network operates in accordance with the UMTS Standard.

Add the following new claims:

23. A network element as claimed in claim 3, wherein said network element is arranged to send a message to the end element indicating that said connection has been released.

24. A network element as claimed in claim 2, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

25. A network element as claimed in claim 3, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

26. A network element as claimed in claim 4, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

27. A network element as claimed in claim 5, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

28. A network element as claimed in claim 6, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

29. A network element as claimed in claim 7, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

30. A network element as claimed in claim 8, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

31. A network element as claimed in claim 2, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

32. A network element as claimed in claim 3, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

33. A network element as claimed in claim 4, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

34. A network element as claimed in claim 5, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

35. A network element as claimed in claim 6, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

36. A network element as claimed in claim 7, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

37. A network element as claimed in claim 8, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

38. A network element as claimed in claim 9, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

39. A network element as claimed in claim 10, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

40. A network element as claimed in claim 11, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

41. A network element as claimed in claim 2, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

42. A network element as claimed in claim 3, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

43. A network element as claimed in claim 4, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

44. A network element as claimed in claim 5, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

45. A network element as claimed in claim 6, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

46. A network element as claimed in claim 7, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

47. A network element as claimed in claim 8, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

48. A network element as claimed in claim 9, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

49. A network element as claimed in claim 10, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

50. A network element as claimed in claim 11, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

51. A network element as claimed in claim 2, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

52. A network element as claimed in claim 3, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

53. A network element as claimed in claim 4, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

54. A network element as claimed in claim 5, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

55. A network element as claimed in claim 6, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

56. A network element as claimed in claim 7, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

57. A network element as claimed in claim 8, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

58. A network element as claimed in claim 9, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

59. A network element as claimed in claim 10, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

60. A network element as claimed in claim 11, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

61. A network element as claimed in claim 2, wherein said network element is a radio network controller.

62. A network element as claimed in claim 3, wherein said network element is a radio network controller.

63. A network element as claimed in claim 4, wherein said network element is a radio network controller.

64. A network element as claimed in claim 5, wherein said network element is a radio network controller.

65. A network element as claimed in claim 6, wherein said network element is a radio network controller.

66. A network element as claimed in claim 7, wherein said network element is a radio network controller.

67. A network element as claimed in claim 8, wherein said network element is a radio network controller.

68. A network element as claimed in claim 9, wherein said network element is a radio network controller.

69. A network element as claimed in claim 10, wherein said network element is a radio network controller.

70. A network element as claimed in claim 11, wherein said network element is a radio network controller.

71. A network element as claimed in claim 12, wherein said network element is a radio network controller.

72. A network element as claimed in claim 13, wherein said network element is a radio network controller.

73. A network element as claimed in claim 14, wherein said network element is a radio network controller.

74. A network element as claimed in claim 15, wherein said network element is a radio network controller.

75. A network element as claimed in claim 16, wherein said network element is a radio network controller.

76. A network element as claimed in claim 17, wherein said network element is a radio network controller.

77. A network comprising a network element as claimed in claim 2, an end station and an end element.

78. A network comprising a network element as claimed in claim 3, an end station and an end element.

79. A network comprising a network element as claimed in claim 4, an end station and an end element.

80. A network comprising a network element as claimed in claim 5, an end station and an end element.

81. A network comprising a network element as claimed in claim 6, an end station and an end element.

82. A network comprising a network element as claimed in claim 7, an end station and an end element.

83. A network comprising a network element as claimed in claim 8, an end station and an end element.

84. A network comprising a network element as claimed in claim 9, an end station and an end element.

85. A network comprising a network element as claimed in claim 10, an end station and an end element.

86. A network comprising a network element as claimed in claim 11, an end station and an end element.

87. A network comprising a network element as claimed in claim 12, an end station and an end element.

88. A network comprising a network element as claimed in claim 13, an end station and an end element.

89. A network comprising a network element as claimed in claim 14, an end station and an end element.

90. A network comprising a network element as claimed in claim 15, an end station and an end element.

91. A network comprising a network element as claimed in claim 16, an end station and an end element.

92. A network comprising a network element as claimed in claim 17, an end station and an end element.

93. A network comprising a network element as claimed in claim 18, an end station and an end element.

94. A network element as claimed in claim 20, wherein said end element is SGSN.

95. A network as claimed in claim 20, wherein said network operates in accordance with the UMTS Standard.

96. A network as claimed in claim 21, wherein said network operates in accordance with the UMTS Standard.

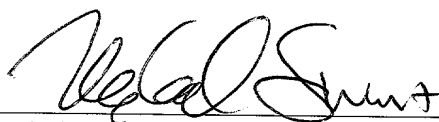
REMARKS

This preliminary amendment is presented to place the application in proper form for examination and to eliminate multiple dependency from the present claims. No new matter has been added. Early examination and favorable consideration of the above-identified application is earnestly solicited.

Any additional fees or charges required at this time in connection with the application may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
COHEN, PONTANI, LIEBERMAN & PAVANE

By:



Michael C. Stuart
Reg. No. 35,698
551 Fifth Avenue, Suite 1210
New York, N.Y. 10176
(212) 687-2770

29 November 2001

AMENDMENTS TO THE SPECIFICATION AND CLAIMS SHOWING CHANGES

In the Claims:

4. A network element as claimed in claim 2 [or 3], wherein said network element is arranged to send a message to the end element indicating that said connection has been released.

9. A network element as claimed in [any preceding] claim 1, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

12. A network element as claimed in [any preceding] claim 1, wherein said determining means is arranged to determine if the connection is to be released based on the state of the end station.

13. A network element as claimed in [any preceding] claim 1, wherein said determining means is arranged to determine if the connection should be released based on the movement of the end station.

16. A network element as claimed in [any preceding] claim 1, wherein said determining means is arranged to determine if the connection should be released based on the location of said end station.

18. A network element as claimed in [any preceding] claim 1, wherein said network element is a radio network controller.

19. A network comprising a network element as claimed in [any preceding] claim 1, an end station and an end element.

21. A network element as claimed in claim 19 [claims 19 or 20], wherein said end element is SGSN.

22. A network as claimed in claim 19 [claims 19, 20 or 22], wherein said network operates in accordance with the UMTS Standard.

RELEASING A CONNECTION IN A WIRELESS COMMUNICATION NETWORK**Field of the Invention**

5 The present invention relates to a network element for use in a communications network. In particular, but not exclusively, the network element is a radio network controller in a code division multiple access wireless cellular communications network.

10

Background of the Invention

15 The use of code division multiple access (CDMA) is being proposed for the next generation of cellular telecommunication networks. Additionally, code division multiple access is also being used in the IS-95 standard in the USA. CDMA is a direct sequence spread spectrum technique. In a wireless cellular network using CDMA, the mobile stations in one cell associated with a first base station will use the same frequency as mobile stations in an adjacent cell associated with the second base station. The different mobile stations can be distinguished by the respective base stations as each mobile station will be using a different spreading code.

25

30 In one of the new CDMA standards which is currently being proposed, connections are made between a mobile station to a base station, from the base station to a radio network controller and from the radio network controller to a core network. The core network is arranged to control the establishment and release of connections between the mobile station and the core network. With "bursty" traffic which consists of packets of data which are sent irregularly, the

core network is unable to predict the traffic which is to be transmitted between the core network and the mobile station and vice versa.

5 It has been proposed that a timer mechanism be used by the core network in order to control the release of the connection. For example, if a packet of data has not been received for X seconds, then the connection is released.

10 This method has the problem that the core network may not release this connection at an appropriate time. This is because the core network is not aware of parameters of the radio network controller or the mobile station which might indicate that an earlier break in the connection was
15 appropriate. This may result in connections being maintained longer than required. This unnecessarily uses up resources within the network, which may reduce the amount of traffic which can be supported.

20 **Summary of the Invention**

It is an aim of embodiments of the present invention to address this problem.

25 According to one aspect of the present invention, there is provided a network element for use in a communications network, said network element being arranged between a mobile station and an end element, wherein connections are established between said mobile station and said end element
30 via said network element, said network element comprising means for determining if the connection between said end element and said mobile station is to be released.

Brief Description of the Drawings

For better understanding of the present invention and as to how the same may be carried into effect, reference will now
5 be made by way of example to the accompanying drawings in which:-

Figure 1 shows a cellular telecommunication network in which embodiments of the present invention can be incorporated;

10 Figure 2A shows a mobile station in communication with two base stations under the control of a single radio network controller;

Figure 2B shows a mobile station in communication with two base stations, each of which is connected to a different
15 radio network controller;

Figure 3A shows the connection before the serving radio network controller is changed;

Figure 3B shows the connections after the serving radio network controller has been changed;

20 Figure 4 shows the various radio resource control modes;

Figure 5 shows a first embodiment of the present invention; and

Figure 6 shows a second embodiment of the present invention.

25 Detailed Description of Embodiments of the Present Invention

Reference will first be made to Figure 1 in which three cells 2 of the cellular telecommunications network are shown. Each cell 2 is served by a respective base
30 transceiver station (BTS) 4. The base station is sometimes called node B in CDMA systems. Each base transceiver station is arranged to transmit signals to and receive signals from the mobile stations 6 located in the cell

associated with the given base transceiver station 4. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4.

5

The cellular telecommunications network shown in Figure 1 uses a code division multiple access technique.

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With the proposed new CDMA standard, macro diversity is possible. This means that a mobile station can be connected to more than one radio network controller RNC at the same time. However, as far as the core network is concerned, these connections are controlled by one radio network controller which is defined as the serving radio network controller SRNC. This serving radio network controller SRNC communicates with a third generation serving GPRS support node 3G-SGSN. This serving GPRS support node is analogous to that of the GPRS standard used in conjunction with the GSM standard but has been modified so as to be usable with the CDMA standard.

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Reference is made to Figure 2A. In Figure 2A, a mobile station 6 is in communication with two base stations 4a and 4b. Each of these base stations 4a and 4b is connected to the same radio network controller RNC 10a. The common radio network controller 10a is thus the serving radio network controller and is connected to the core network 12. This core network 12 is represented by the dashed line and is the part of the network upstream of the serving radio network controller. The serving radio network controller 10a is in fact connected to the third generation serving GPRS support node 3G-SGSN 14 of the core network 12.

Reference is now made to Figure 2B which shows the mobile station 6 connected to two base stations 4c and 4d. However, unlike in Figure 2A, one base station 4c is connected to one radio network controller 10c whilst the other base station 4d is connected to a second radio network controller 10b. One of these radio network controllers acts as the serving radio network controller SRNC 10b. In the embodiment shown in Figure 2B, the second radio network controller 10b acts as the serving radio network controller. The other radio network controller 10c is defined as being a drift radio network controller DRNC. The drift radio network controller 10c is connected to the serving radio network controller 10b. The serving radio network controller 10b is, as in the arrangement shown in Figure 2A, connected to the SGSN 14. In the arrangement shown in Figure 2A, the drift radio network controller and the serving radio network controller are the same radio network controller.

The serving radio network controller 10a or b is able to combine information received from the mobile station 6 via the two different base stations 4a-d, regardless of whether or not the base stations are connected to the same radio network controller or different radio network controllers. In the latter situation, the drift radio network controller 10c would forward information from the respective base station 4c to the serving radio network controller 10b. The serving radio network controller 10b also copies information which is intended for a given mobile station 6 to the relevant drift radio network controller 10c so that the base station 4c connected to the serving radio network controller 10b as well as the base station connected to the drift radio

network controller 10c can be transmit the same information, where appropriate, to the mobile station 6.

The serving radio network controller SRNC is arranged to control the information transfer and request for radio resources from the appropriate drift radio network controllers DRNC. The drift radio network controllers only relay information between the mobile station and the serving radio network controller SRNC.

It is preferred that the same serving radio network controller SRNC be used for packet switched traffic (i.e. data transmitted in packet form) and circuit switched traffic i.e. speech.

When a mobile station moves, the base station or base stations with which the mobile station is in communication needs to change. This may mean that a different serving radio network controller may be required. This is described in relation to Figures 3A and 3B. In the arrangement shown in Figure 3A, the mobile station 6 is in communication with a single base station 4. This base station 4 is connected to the drift radio network controller 10c. The drift radio network controller is connected to the serving radio network controller 10b, as shown in Figure 2B. The serving radio network controller is connected to the current SGSN 14 which is in turn connected to the gateway GPRS serving node 16. Accordingly, signals to and from the mobile station follow the following path: mobile station 6 to the base station 4c connected to the drift RNC 10c, to the drift RNC 10c, from the drift RNC 10c to the serving RNC 10b, from the serving RNC 10b to the current SGSN 14 and from the current SGSN 14

to the GGSN 16. The same path is used for signals from the GGSN 16 to the mobile station 6, but in reverse.

The SGSN 14 also has a connection to a home location register 18. Each radio network controller 10b and 10c is connected to respective 3G mobile services switching centres 20a and 20b. The drift radio network controller 10c is connected to a different serving GPRS support node 22, which is not in use in this mode. There is also a connection between the home location register 18 and the third generation mobile services switching center 20a connected to the serving radio network controller 10b.

Reference is now made to Figure 3B which shows the connections which are established once the serving radio network controller has changed. In this arrangement, the drift radio network controller 10c becomes the serving radio network controller. The serving radio network controller 10b may become a drift radio network controller or may not be involved in communications with the mobile station 6. The mobile station continues to send and receive signals from the base station 4c connected to the new serving radio network controller 10c. The new serving radio network controller 10c has established a connection with the SGSN 22 to which it is connected. Signals from the serving GPRS node 22 connected to the new serving radio network controller 10c are passed to the GGSN 16. A connection is established between the home location register HLR 18 and the mobile services switching centre 20b connected to the new serving radio network controller 10c. A connection is also established between the home location register 18 and the SGSN 22 connected to the new serving radio network controller 10c.

This relocation procedure takes place when the target radio network controller (i.e. a drift radio network controller) is controlling all of the communications to and from the mobile station. In other words, the serving radio network controller does not communicate with the mobile station with any of the base stations which it controls.

The connection between the mobile station 6 and the GGSN 16 is now via the base station 4c, the new serving radio network controller 10c, and the new SGSN 22.

Radio resource control provides the common control and signalling between the radio network controller and the mobile station. The same radio resource control connection is used both by speech and packet data traffic. The radio resource control (RRC) modes are illustrated schematically in Figure 4. In the RRC-idle mode 30, there is no connection established between the mobile station and the universal mobile telecommunications system terrestrial radio access network (UTRAN). UTRAN is the combination of RNC(s) and BTS(s). If the user equipment is attached to the network, but in RRC-idle mode (which implies that the mobile is not in active communication), the location is tracked by the SGSN. In this mode, there is no signalling between the UTRAN and the mobile station except for system information that is sent from the network downlink on a broadcast channel to the user equipment. The user equipment can also receive paging messages in this mode. No information on the mobile station is stored in the UTRAN in this state.

In the connected mode 32, the main states are the cell connected state 34 and the UTRAN Registration Area (URA)

connected state 36. One radio network controller will be acting as the serving radio network controller and a radio resource control connection is established between the mobile station and the serving radio network controller.

5 When the position of the mobile station is known on the cell level, the mobile station is in the cell connected state. The radio resource control connection mobility is handled by hand over procedures. In this state, the radio link may be use different channels:-

10

1. Dedicated Channel (DCH). In this channel, a spreading code is allocated to the mobile station and is solely used by that mobile station.

15

2. Dedicated Shared Channel (DSCH). In this channel, a spreading code is shared amongst a number of mobile stations. The radio channel is optimised for packet traffic.

20

3. Common Channel on the downlink and Random Access Channel on the uplink. These are common channels and are suitable for use with short packets.

When the mobile position is known only on the URA level,
25 i.e. which group of cells it is in, the mobile station is in the URA connected state. The URA comprises a set of cells of the network. In other words, the mobile station is in one of a plurality of cells which together define the URA. The URA updating procedures provide the mobility
30 functioning. Paging is performed for downlink packet transfer.

A radio access bearer represents the connection between the SGSN and the mobile station. The radio access bearer comprises two branches. The first branch is the GTP (GPRS tunnelling protocol) tunnel between the radio network controller and the SGSN. The second branch is between the mobile station and the radio network controller. Between one mobile station and the SGSN, there are as many radio access bearers as there are PDP (packet data protocol) context activated when a radio access bearer is established.

A radio resource control connection is established between the mobile station and the radio network controller, for signalling. However, no radio access bearer may be established. A radio access bearer is established only when the connection between the radio network controller and the SGSN is also established.

Reference is now made to Figure 5. In this arrangement inside the radio network controller 50, a process determines that the RRC connection of a particular mobile station should be released to optimise the use of resources. By releasing the connection which otherwise uses unnecessary signalling, the radio resources of the network are conserved, thus improving capacity and/or quality. The radio network controller 50 therefore sends an Iu release request 54 to the SGSN 52. Iu is the interface between the radio network controller and the SGSN 52. The request sent to the SGSN 52 indicates the reason why the bearer should be released. In the embodiments of the invention, the connection may be broken in order to optimise resources. This will be described in more detail hereinafter.

It is known to release the connection if the operation and maintenance controller of the network has intervened and

wants the connection to be broken or if there is equipment failure at some point between the mobile station and the SGSN 52.

- 5 The SGSN 52 decides whether or not to confirm the request for the release of the radio bearer. If the SGSN 52 agrees that the connection should be broken, a release command 56 is sent to the radio network controller 50 via the Iu interface.

10

- If the radio resource connection between the radio network controller 50 and the mobile station 58 has not already been released, the radio network controller sends a radio resource control connection release message 60 to the mobile station. The mobile station releases the connection and sends a radio resource control connection released message 62 to the radio network controller 50. The radio network controller 50 then sends a confirmation 59 that the connection has been released to the SGSN 52 on the Iu interface.
- 15
- 20

- Reference is now made to Figure 6 which shows an alternative embodiment to that shown in Figure 5. In the embodiment shown in Figure 6, the radio network controller 50 does not send a release request to the SGSN 52. Instead, the RNC 50 sends a release radio connection message 64 to the mobile station 58. The mobile station sends an acknowledgement message 66 to the radio network controller 50 and the connection therebetween is broken. The radio network controller 50 then advises the SGSN 52 via the Iu interface that the connection has been released. The SGSN 52 then releases all of the Iu connections. This alternative signalling is applicable particularly if there is no need of
- 25
- 30

confirmation from the SGSN. The RNC process which triggers the signalling procedure shown in Figure 5 or 6, should make the decision to release the RRC connection of a particular mobile station based (among other things) on the quality of service profile of the radio access bearer established. The process may only release the RRC connection, if the quality of service profile indicates that this bearer(s) are used for bursty traffic between the SGSN 52 and the mobile station 58. This type of traffic is indicated by the traffic class parameter.

One class of traffic is referred to background traffic whilst the other type of traffic is interactive traffic. Background traffic is, for example message traffic which is not time sensitive whilst interactive traffic is, for example traffic resulting in web browsing. With both of these types of traffic, the SGSN is unable to predict when and what traffic is to be forwarded to the mobile station and likewise when and what traffic is going to be received from the mobile station. The radio network controller carries out a process to control the release of the bearer for one or more of the following reasons:

1. The radio network controller has a timer which measures the time since the last packet was transferred to or received from the mobile station. If a given time lapses without a packet being transferred, then the radio network controller releases the connection. Different times may be used depending on the quality of services profile, in particular whether or not the traffic is interactive or background traffic. A shorter time may be provided for background traffic.

2. The radio network controller can take into account the radio state of the mobile station. For example, the RNC may release the RRC connection only in the URA connected mode.

3. The connection may be kept when another radio bearer is established, for example from the mobile switching centre to the mobile station via the radio network controller. The reason is that the RNC has to keep this mobile RRC-connected for this circuit switched connection, so that it can maintain the radio access bearer for a packet connection without using additional resources.

4. The radio network controller can take into account the movement of the mobile station. If the mobile station is moving above a given speed, the bearer connection may be released. A fast moving mobile station uses up a relatively large amount of radio resources for updates (e.g. URA updates). The radio network controller could set a maximum number of URA updates, for example 10 and if no user data traffic has been received within that time, the connection could be released. This is an elegant way to take into account the mobile movement.

5. The radio network controller may release the connection if the mobile station enters an area controlled by a different radio network controller. In this regard, reference is made to Figures 3a and 3b.

As mentioned hereinbefore, a combination of these methods may be used for determining if a radio network controller should release the bearer. For example, if a mobile station, which is in the URA update state enters a new radio network controller area, the serving radio network

controller can be arranged to release the radio bearer. This may in turn trigger a routing area update from the mobile station. The routing area update is used by mobile to inform the SGSN of its location in RRC-idle mode.

- 5 If the bearer is released the internal resources of the radio network controller can be conserved. For example, each time a connection is established, the radio network controller requires some buffer resource to be allocated thereto. If a connection is not being used, the buffer
10 resource may be wasted.

In another example, if a mobile station has a circuit switch connection i.e. speech connection, the radio network controller could keep the packet bearer established longer
15 than otherwise. This is because a user is more likely to transfer data during or after a call and the radio network controller would merely have to re-establish that bearer otherwise.

- 20 In one modification of the embodiments described hereinbefore, the SGSN could be arranged to give an indication in the bearer set up procedure to the radio network controller whether or not the radio network controller is permitted to suggest the release of the
25 bearer. Rules associated with this may also be transferred from the SGSN to the radio network controller. Those rules may take any suitable form. The indication in the bearer set up may be implicitly derived by the radio network controller from quality of service parameters provided by
30 the SGSN to the radio network controller.

The SGSN could indicate the timer value, or indicate not to release RRC connection if a bearer with particular quality

of service profile is established. The SGSN can thus instruct the RNC as to how it should interpret the rules which it has for determining when to release a connection.

- 5 Whilst the present invention has referred to mobile stations, it should be appreciated that embodiments of the present invention are applicable to other types of user equipment, for example computer terminals. These computer terminals may be fixed or mobile.

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Embodiments of the present invention have been described in the context of a code division multiple access system. It should be appreciated that embodiments of the present invention can be used with any other suitable spread spectrum access technique, frequency division multiple access techniques, time division multiple access technique or hybrids thereof.

15

CLAIMS:

1. A network element for use in a communication network,
said network element being arranged between a mobile station
5 and an end element, wherein connections are established
between said mobile station and said end element via said
network element, said network element comprising means for
determining if the connection between said end element and
said mobile station is to be released.

10 2. A network element as claimed in claim 1, wherein said
network element is arranged to release said connection when
the determining means determines that the connection is to
be released.

15 3. A network element is claimed in claim 2, wherein said
network element is arranged to release the connection
between the network element and said mobile station.

20 4. A network element as claimed in claim 2 or 3, wherein
said network element is arranged to send a message to the
end element indicating that said connection has been
released.

25 5. A network element as claimed in claim 1, wherein said
network element is arranged to send a request for the
connection to be released to said end element.

30 6. A network element as claimed in claim 5, wherein the
end element sends a connection release command to said
network element in response to the release request received
by said network element, said network element controlling
the release of said connection.

7. A network element as claimed in claim 6, wherein said network element is arranged to send a release request to said mobile station in response to the release command received from said end element.

8. A network element as claimed in claim 7, wherein said network element is arranged to send a message to said end element advising that the connection has been released.

9. A network element as claimed in any preceding claim, wherein said determining means determines that the connection is to be released if the connection has not been used for a predetermined time.

10. A network element as claimed in claim 9, wherein the predetermined time depends on the type of traffic for which the connection is intended.

11. A network element as claimed in claim 9, wherein the predetermined time depends on the quality of service profile of the traffic for which the connection is intended.

12. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection is to be released based on the state of the mobile station.

13. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection should be released based on the movement of the mobile station.

14. A network element as claimed in claim 13, wherein the amount of updating information received in a given time from the mobile station is used as a measure of the movement of the mobile station.

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15. A network element as claimed in claim 14, wherein said updating information comprises URA updates.

10 16. A network element as claimed in any preceding claim, wherein said determining means is arranged to determine if the connection should be released based on the location of said mobile station.

15 17. A network element as claimed in claim 16, wherein said determining means determines that the connection should be released if the mobile station is associated with a different network element.

20 18. A network element as claimed in any preceding claim, wherein said network element is a radio network controller.

19. A network comprising a network element as claimed in any preceding claim, a mobile station and an end element.

25 20. A network as claimed in claims 19 or 20, wherein said end element is a SGSN.

21. A network as claimed in claims 19, 20 or 21 wherein said network operates in accordance with the UMTS Standard.

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Fig.1.

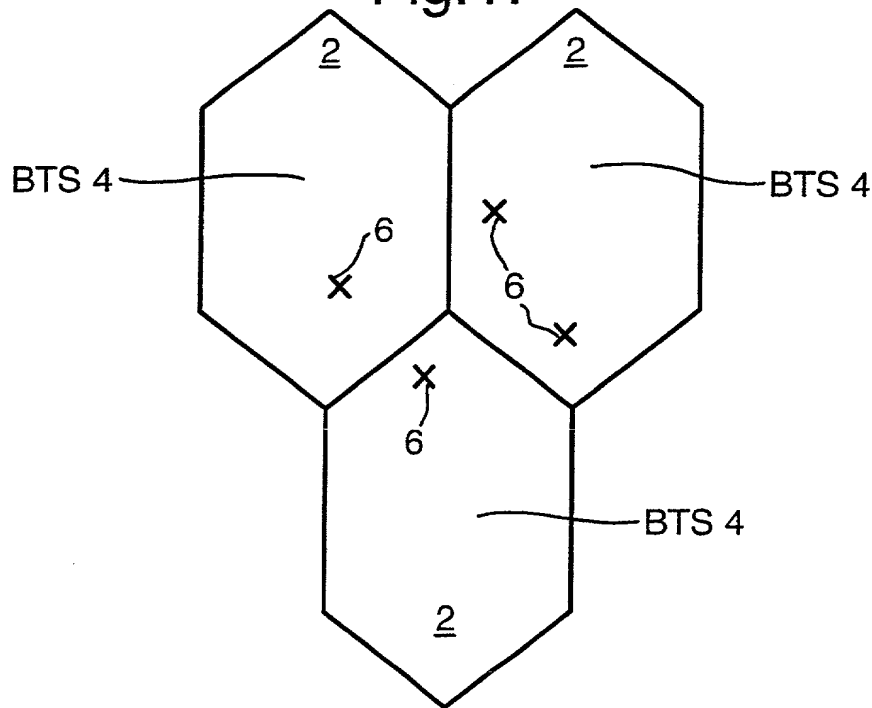


Fig.2A.

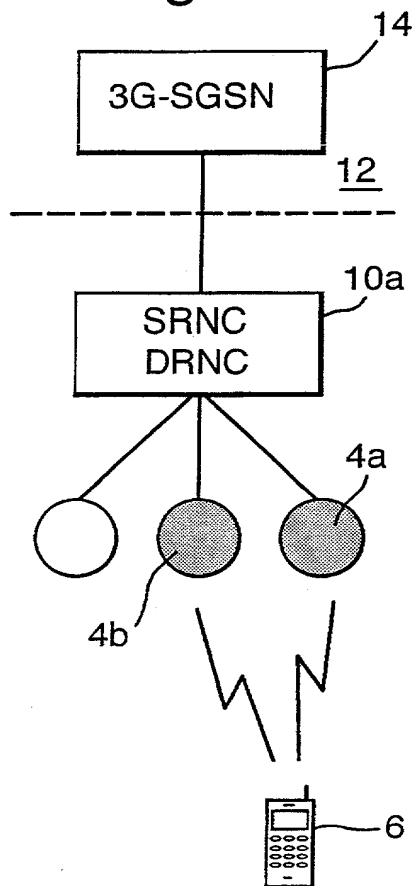
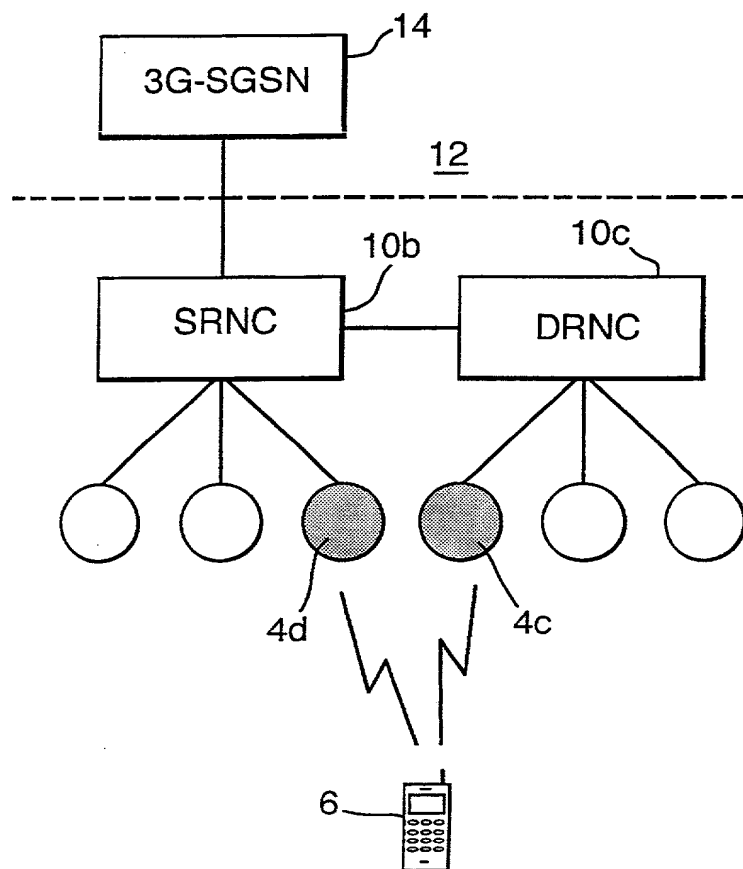


Fig.2B.



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Fig.3A.

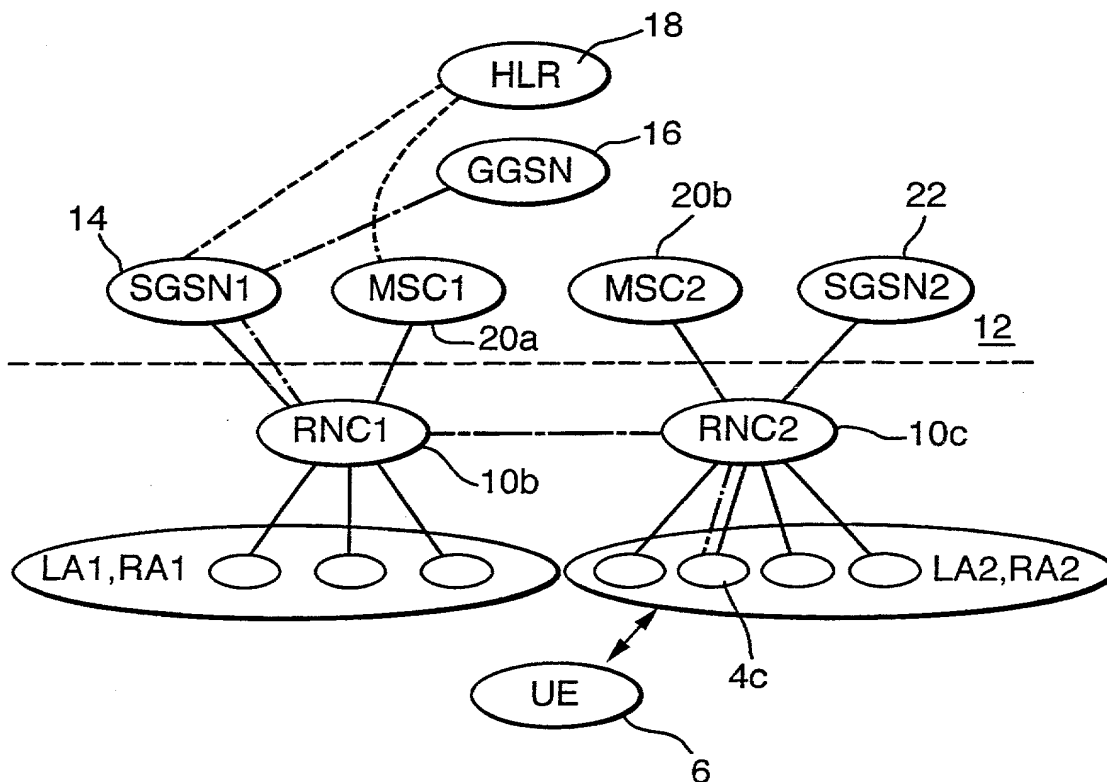


Fig.3B.

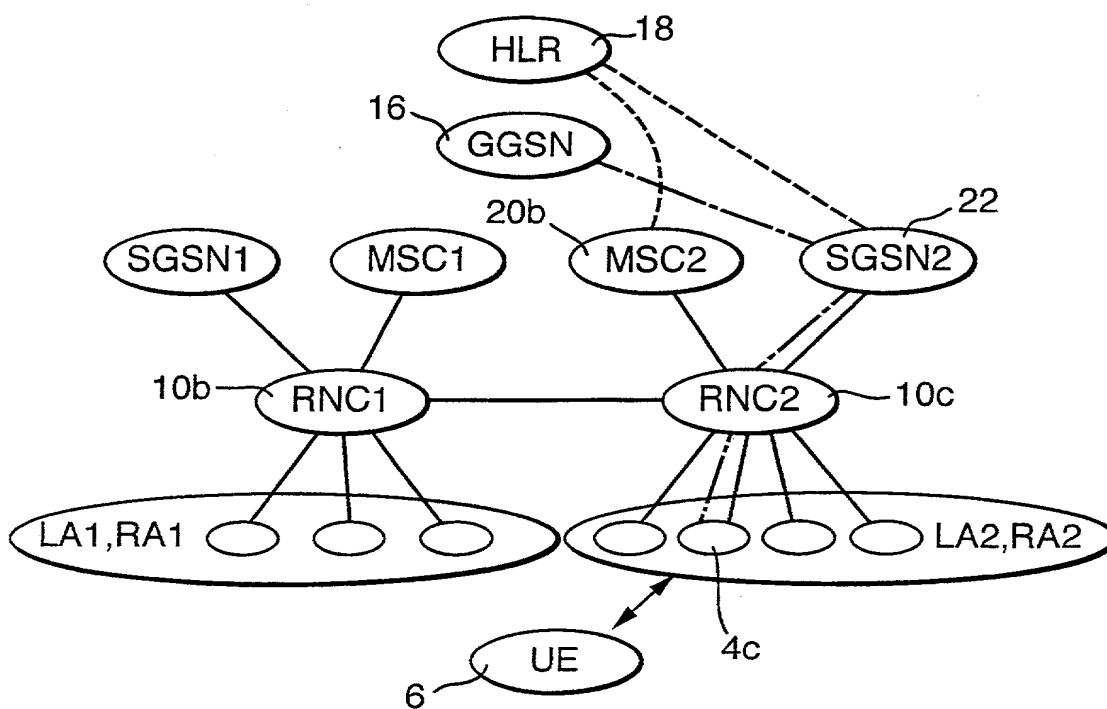


Fig.4.

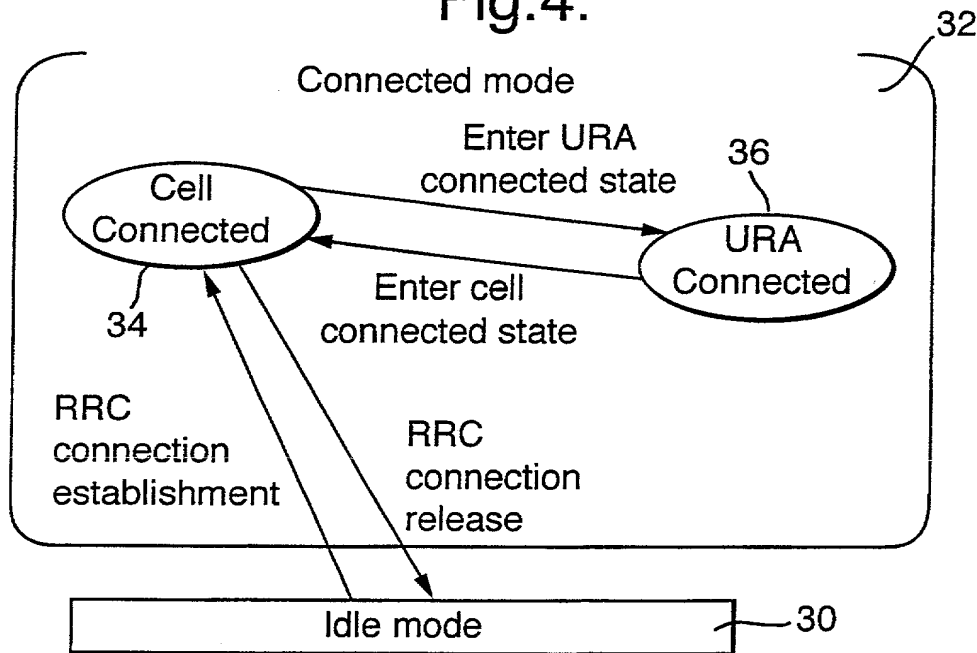


Fig.5.

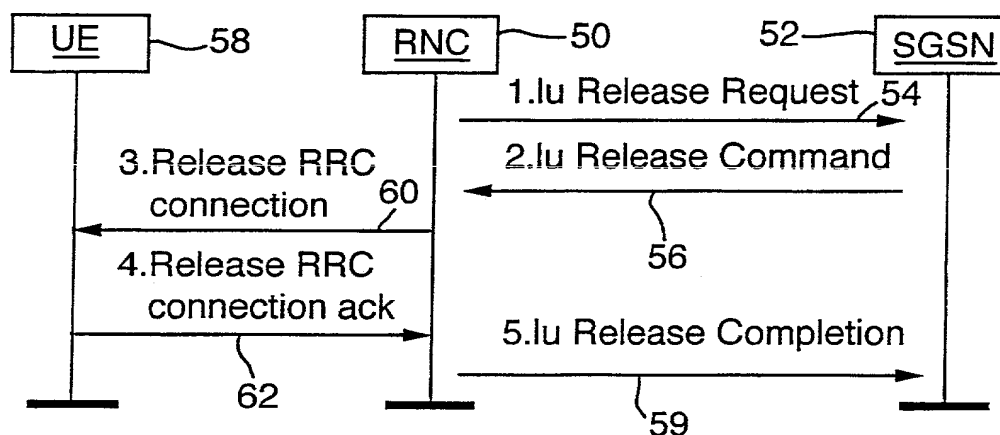
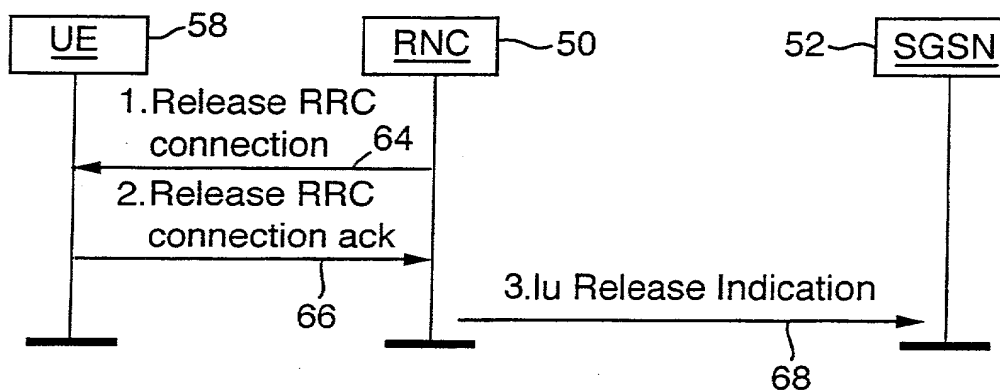


Fig.6.



COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
Includes Reference to PCT International Applications

Attorney's Docket
No. **4925-184PUS**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

RELEASING A CONNECTION IN A WIRELESS COMMUNICATION NETWORK

the specification of which (check only one item below)

☐ is attached hereto

☒ was filed as United States application

Serial No. 09/980,376

On November 29, 2002

And was amended

On (if applicable).

☐ was filed as PCT international application

Number PCT/EP00/04231

on 09 May 2000

and was amended under PCT Article 19

on (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of the application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

PRIOR FOREIGN/PCT APPLICATIONS AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

Country (if PCT, indicate "PCT")	Application Number	Date of Filing (day, month, year)	Priority Claimed Under 35 U.S.C. 119	
Great Britain	9913092.4	04 June 1999	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
PCT	PCT/EP00/04231	09 May 2000	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO
			<input type="checkbox"/> YES	<input type="checkbox"/> NO

Combined Declaration for Patent Application and Power of Attorney (Continued)
(Includes Reference to PCT International Applications)

Attorney's Docket No.
4925-184PUS

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		
PCT/EP00/04231	09 May 2000		x	

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (*List name and registration number*)

MYRON COHEN, Reg. No. 17,358; THOMAS C. PONTANI, Reg. No. 29,763; LANCE J. LIEBERMAN, Reg. No. 28,437; MARTIN B. PAVANE, Reg. No. 28,337; MICHAEL C. STUART, Reg. No. 35,698; KLAUS P. STOFFEL, Reg. No. 31,668; EDWARD WEISZ, Reg. No. 37,257; VINCENT M. FAZZARI, Reg. No. 26,879; JULIA S. KIM, Reg. No. 36,567; ALFRED FROEBRICH, Reg. No. 38,887; ALFRED H. HEMINGWAY, JR., Reg. No. 26,736; KENT H. CHIENG, Reg. No. 33,849; YUNLING REN, Reg. No. 47,019; ROGER S. THOMPSON, Reg. No. 29,594; BRICE FALLER, Reg. No. 29,532; DAVID J. ROSENBLUM, Reg. No. 37,709; TONY CHEN, Reg. No. 44,607; ELI WEISS, Reg. No. 17,765; TEODOR J. HOLMBERG, Reg. No. 50,140.

Send correspondence to:

Michael C. Stuart
Reg. No. 35,698
Cohen, Pontani, Lieberman & Pavane
551 Fifth Avenue, Suite 1210
New York, New York 10176

Direct Telephone calls to:
(name and telephone number)
Michael C. Stuart
(212) 687-2770

201	FULL NAME OF INVENTOR <u>1-00</u>	FAMILY NAME <u>HAUMONT</u>	FIRST GIVEN NAME <u>Serge</u>	SECOND GIVEN NAME
	RESIDENCE, CITIZENSHIP	CITY <u>Helsinki</u>	STATE OR FOREIGN COUNTRY <u>Finland</u> FIX	COUNTRY OF CITIZENSHIP <u>Finland</u>
	POST OFFICE ADDRESS	POST OFFICE ADDRESS <u>Riistavuorenkuja 3 B</u>	CITY <u>Helsinki</u>	STATE & ZIP CODE/COUNTRY <u>FIN-00320 Finland</u>
202	FULL NAME OF INVENTOR <u>2-0</u>	FAMILY NAME <u>AIIMAVAARA</u>	FIRST GIVEN NAME <u>Kalle</u>	SECOND GIVEN NAME
	RESIDENCE, CITIZENSHIP	CITY <u>Helsinki</u>	STATE OR FOREIGN COUNTRY <u>Finland</u> FIX	COUNTRY OF CITIZENSHIP <u>Finland</u>
	POST OFFICE ADDRESS	POST OFFICE ADDRESS <u>Hakaniemenranta</u>	CITY <u>Helsinki</u>	STATE & ZIP CODE/COUNTRY <u>FIN-00530 Finland</u>

